

The New York Times | <https://nyti.ms/2eKGV5l>

SCIENCE

In Canada, a Direct Link Between Fracking and Earthquakes

By HENRY FOUNTAIN NOV. 17, 2016

In the debate over fracking of oil and gas wells, opponents often cite the risk that the process can set off nearby earthquakes. But scientists say that in the United States, fracking-induced earthquakes are not common.

In Canada, however, a spate of earthquakes in Alberta within the last five years has been attributed to fracking, or hydraulic fracturing, in which water, chemicals and sand are injected at high pressure into a well drilled in a shale formation to break up the rock and release oil and gas.

Now, scientists at the University of Calgary who studied those earthquakes, near Fox Creek in the central part of the province, say the quakes were induced in two ways: by increases in pressure as the fracking occurred, and, for a time after the process was completed, by pressure changes brought on by the lingering presence of fracking fluid.

“The key message is that the primary cause of injection-induced seismicity in Western Canada is different from the central United States,” said David W. Eaton, a professor of geophysics at the University of Calgary and co-author of a paper in the journal *Science* describing the research. The findings could help regulators take steps to avoid such induced earthquakes, he said.

Scientists say most of the recent earthquakes in Oklahoma and other parts of the United States have been caused by the burial of wastewater from all kinds of oil and gas wells rather than by the fracking process itself. Wastewater is injected under pressure into disposal wells drilled into a sandstone or other permeable formation, and flows into the rock. That can cause pressure changes in the formation that can upset the equilibrium around a fault zone, causing an earthquake as the fault slips.

In the Fox Creek area in Alberta, where oil and gas companies have been drilling in recent years into a formation called the Duvernay shale, earlier research had seen links between the earthquakes — all of which were minor and caused little damage — and fracking, rather than wastewater injection.

In their work, Dr. Eaton and Xuewei Bao, a postdoctoral researcher, looked into the links in more detail, analyzing seismic data from a series of quakes at Fox Creek in late 2014 and early 2015, and records from wells where fracking was occurring at the time.

They found two patterns to the seismicity. To the east in the fault zone, most of the earthquakes occurred during the fracking process itself, which lasted up to a month. To the west, there were few immediate quakes; they occurred intermittently over several months after the fracking ended.

Dr. Eaton said the fracking process could be likened to small underground explosions, shocks that travel into the rock formation and rapidly change the stress patterns within. “If there is a critically stressed fault, those stress changes are sufficient to push it over the edge,” he said. That appears to be what happened in the eastern direction.

Once the fracking stops, those stresses relax fairly quickly, he said. But they found that to the west, much of the fracking fluid remained underground in the fractured shale. That would lead to more persistent pressure within the fault zone, and more earthquakes over time.

Dr. Eaton said he and others were conducting more research to understand why Alberta responds differently to fracking than Oklahoma and other parts of the

United States. “It’s a different situation,” he said, “and understanding the origin of the differences is important.”

Follow Henry Fountain on Twitter @henryfountain.

Like the Science Times page on Facebook. | Sign up for the Science Times newsletter.

A version of this article appears in print on November 18, 2016, on Page A3 of the New York edition with the headline: In Alberta, a Link Between Fracking and Earthquakes.

© 2017 The New York Times Company